Effect of Hydrophobic Treatment of Gas Diffusion Layer of PEMFC on Mass Transport and Electric Conductivity

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ABSTRACT

The objectives of this research are to look into the fundamental properties of the gas diffusion layer of a PEMFC and to investigate the influence of hydrophobic treatments of gas diffusion layer on its electric conductivity. Furthermore, with an aim to thoroughly understand its functional variations, this thesis also carries out experiments to measure the changes in porosity, thickness, and electric conductivity of gas diffusion layer under various pressure levels. The gas diffusion layer, made of carbon fibers, is a kind of porous media whose structural properties depend substantially on its hydrophobic treatments. In this research, apparatus are fabricated to measure the variation of porosity due to its hydrophobic treatments. Then, measurements of the electric conductivity on the gas diffusion layer are performed under pressure load; finally SEM is adopted to investigate the structure change of fibers before and after pressure loading. The results show that the porosity of a gas diffusion layer decreases as the extent of hydrophobic treatments increases. However, under pressure load, the decrease in porosity is mitigated with the help of hydrophobic treatments because the robustness of the gas diffusion layer is enhanced by the hydrophobic treatments. Fragmentation of fibers has also been observed after pressure loading, while the electric conductivity of gas diffusion layer increases, which may attribute to the compactness of the gas diffusion layer under pressure loading.

Keywords : PEMFC, Gas diffusion layer, Hydrophobic, Porosity

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